

INVENTARISATION OF PESTS, DISEASES
AND GERMPLASM OF CHILLI PEPPERS IN LOWLAND AREAS OF
INDONESIA

By :

Ati Srie Duriat (Virology)
J.G.M. Vos (Integrated Plant Protection)
Tinny Suhantini Uhan (Entomology)
Yenny Kusandriani (Plant Breeding)

Report of a trip to Jakarta, Bekasi and Lampung

August '31 - September 10, 1938

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INTRODUCTION

Chilli pepper (Capsicum annuum L.) is an important horticultural commodity. It is daily consumed by almost all Indonesian people of all culture, social status and personal income. Chilli peppers are also needed for the medical industry and for food and beverage factories. Although the annual production of pepper is increasing, the amount of imported pepper is still exceeding the amount of exported pepper (Annex 1).

The average yield of pepper in Indonesia is very low : about two tons per hectare (Annex 2). According to an experiment of PT PUSRI and LPH Jakarta, the production of chilli pepper can reach 10 tons per hectare (Ettu Sumiati and Herbagiandono, 1985).

The low yield may be caused by the use of low-yielding local cultivars, by attacks of pests and diseases, by poor cultural practices or other influences. An increase of the pepper production could be achieved by using higher yielding varieties. The local varieties however, usually show more flexibility towards attacks by pests and diseases.

The severity of pest problems such as army worm (Spodoptera sp.), fruit fly (Dacus sp.), cut worm (Agrotis sp.) and sucking insects can be influenced by the climate and depends on the condition and maintenance of the crop. Diseases such as anthracnose, *Cercospora* leaf spot and diseases caused by virus, are also influenced by climatic factors and the condition of the crop.

The survey on pests and diseases of lowland vegetables during the rainy season of 1988 indicated that the pests which attacked pepper were mites, thrips, Spodoptera litura, Dacus dorsalis, aphids, Epilachna sp. and Plusia sp. The diseases which occurred were *Cercospora* leaf spot, anthracnose, neckrot (Sclerotium), bacterial wilt (Pseudomonas solanacearum), bacterial spot (Xanthomonas compestris pv. vesicatoria), nematodes (Meloidogyne and Helicotylenchus sp.) and virus diseases (single or mix of CMV, TEV, TRV, PVA, PVY and other viruses) (Suhardi, 1988).

As mentioned above, the occurrence of pests and diseases is influenced by many factors. This survey was carried out in order to get an impression of the problems with growing of chilli pepper in the dry season. The objectives of the survey were :

1. To collect local cultivars in each area for breeding purpose.
2. To make an inventory of the pests and diseases occurring in the dry season.
3. To get information about the control measures of pests and diseases, applied by the farmers.
4. To obtain information about the pesticides used.

RESEARCH METHODOLOGY

During the survey several locations in Jakarta, Bekasi and Lampung were visited. For the time-schedule of the survey see Annex 3. The Dinas Pertanian of the kabupaten guided us to the desa's that were visited. The participants of the survey were : Ati Srie Duriat (Virology), Janny Vos (Integrated Plant Protection), Tinny Suhantini Uhan (Entomology), Yenny Kusandriani (Plant Breeding) and Sadimin (assistant Virology).

Mature fruits of healthy looking plants were collected for the germplasm collection. A morphological description of every cultivar was made.

In every location diseased plants were studied. Leaves, fruits and sometimes pieces of stems and roots of plants which carried symptoms of diseases and insect pests were sampled. Sometimes soil was collected to be checked on soil-borne diseases. The sampled leaves with disease symptoms were dried in order to conserve the pathogens. Samples which showed fungus like symptoms were dried between newspaper. Of plants which showed virus-like symptoms, leaves were cut in slices and dried on CaCl_2 . Insects were collected in plastic boxes with parts of the plant material showing damage.

Also data were collected by interviewing farmers and the agricultural extension service and also by collecting statistical information.

After the survey the sampled material was examined in the laboratory. The several diseases were identified by examining the symptoms and isolating the pathogen in case of fungal or bacterial diseases, or by serological tests in case of viral diseases. Insects were identified on genus and species.

The collected fruits were also observed, but the seeds will have to be grown for further investigation.

RESULTS AND DISCUSSION

General Impression

Vegetable areas in the big city of Jakarta show an intensive cultivation of mostly leaf-vegetables. These crops were very healthy. This is due to intensive maintenance by the farmers. When a disease or pest occurs, they are able to observe and control this in an early stage.

In the other visited areas chilli pepper was grown in the dry season. The rotation mainly is paddy rice-chilli pepper. The farmers grow chilli pepper in the dry season if the price for chillies is high enough. It is evident that the choice of crop by the farmer mainly depends on the market prices for vegetables and other crops. The harvested chillies are partly sold on local markets. The rest is transported to the nearest big city or to industrial factories for further processing.

The way of cultivation of the chilli peppers differed per visited location. The crop was planted in rain-fed soil or on sawahs. Some had good irrigation and others didn't have any irrigation at all. The planting space varied between (20-40) cm x (30-60) cm and plants on beds were arranged in single or double rows. Most of the planting systems were conventional : plants grown on beds without irrigation. Sometimes, chilli pepper was grown in combination with other crops like tomato, beans or other vegetables.

It depends on the location which cultivar of peppers is used. In Bekasi the cultivars "Paris Batu" and "Paris Minyak" are most popular. In Lampung the "Tampar" cultivar is mostly planted.

In most observation sites the pepper crops looked bad. Many plants were attacked by insect pests (mostly thrips and mites). Beside that virus-symptoms and fungal diseases were observed. Bacterial diseases didn't seem to be very important.

One field in Lampung Timur looked quite chaotic; many different crops were grown together and at the same time weeds grew abundantly. Pepper plants were already very old, and suffered from many insect pests and diseases.

The best plantations were found in Sumber Agung, kecamatan Pringsewu. The pepper plants were grown on high beds and were irrigated like in the "surjan" system (sunken and raised bed system) as used in Brebes. In the sunken bed lowland rice is grown and on the raised bed vegetables are intercropped : e.g. shallot and chilli pepper. The pepper plants looked relatively good, although the problems with thrips and mites were beginning.

Germplasm Collection

Chilli pepper is a mainly selfing crop but crossing also occurs. The farmers use seeds from their own plants as propagation material for the next season. In this way local varieties are maintained. As these local varieties are not homozygous, many different genotypes can be found in the field. For the description of the different varieties collected, see annex 4. In the area of Bekasi some types of "cabe besar" are found, while in Lampung most of the farmers grow the chilli type "cabe keriting".

The collected fruits were taken from vigorous and healthy looking plants. Fruits and seeds were also obtained from local markets and some farmers. In order to obtain more information, the seeds will be extracted for use in description trials.

Pests

The data of insects attacking chilli peppers and other observed crops are presented in Annex 5.

On pepper plants thrips and mites proved to be the most important insect pests. The damage in locations with severe damage caused by mites and thrips, the farmers often do not know which pesticide can be used to overcome this problem. Also the long dry season with high temperatures and the high humidity this year contributed to the increase of thrips and mites populations. In kecamatan Serang in Bekasi termites were found which ate the main roots of the pepper plants, which caused wilting and eventually death of the plants. In some locations however, maintenance was very good. Insecticides were there applied mainly in accordance with the recommendations of the extension service.

On the non-pepper crops, Plutella, Phyllotreta and thrips were found on lettuce, mustard, chinese broccoli and caisim. The damage ranged from slight to severe. Insects found on pulling amaranth were Phyllotreta and Epilachna. Kangkung showed some slight damage of two small insects : Oxya and Phyllotreta. Shallot and bunching onion were slightly attacked by Spodoptera and thrips. No insects were found on basil.

Diseases

The data about the diseases found on chilli peppers are presented in annex 6.

Fungal and bacterial diseases

In most locations visited, fungal and bacterial diseases seemed to be of minor importance. The major diseases found were Anthracnose (Colletotrichum sp), Cercospora leaf spot and Fusarium Wilt. These fungal diseases might be more important in the wet season. Because of Anthracnose, fruits become spoiled and therefore useless as marketable product. Cercospora leaf spot makes that leaves and fruits drop, causing a direct decrease of production. Fusarium wilt causes wilting and browning of the plant, followed by death. Bacterial diseases don't seem to be important. Only in few locations wilting of plants was caused by Bacterial Wilt (Pseudomonas solanacearum).

Viral diseases

Virus symptoms are difficult to be recognized in the field due to the mixture of many leaf symptoms caused by insect pests and/or fungal diseases. Although it was hard to identify virus in the field, obvious virus symptoms like mosaic were seen in most locations. Many farmers confuse virus symptoms with symptoms of thrips and mites attack. In the laboratory using ELISA-tests PVY (Potato Virus Y), CMV (Cucumber Mosaic Virus), TRV (Tobacco Rattle Virus) and TRSV (Tomato Ringspot Virus) were detected. The reaction of the ELISA test on PVX (Potato Virus X) and TSV (Tobacco Streak Virus) was difficult to read. The test for TMV still has to be done by using indicator plants.

Pesticides

About 21 different pesticides were used by the pepper farmers. Most of the farmers used certain pesticides because these were recommended by other farmers or by the agricultural extension service. Some farmers in Lampung Tengah and Utara used pesticides but did not know the names. It was difficult to obtain exact information about concentrations and about mixtures farmers applied. For the names of the pesticides used and their active compounds, see annex 7.

CONCLUSIONS

For the summary of all data see table 1. The overall impression from this survey is that the problems are caused by pests, mainly thrips and mites, viral and to a lesser extent fungal diseases. Lack of technical knowledge of the farmers is in many cases also limiting the productivity of the pepper crops. Peppers are grown in many different ways : irrigated or dry, mixed cropped or in monoculture. In the better looking fields, much care is given to the growing of the pepper plants. Almost all farmers rotate paddy rice with pepper. The seed-supply is usually in the hands of the farmers themselves. They harvest seeds from nice looking plants and use that seed for the next year. The local varieties are quite heterogenous.

At the moment of survey, many pepper fields had been harvested already. In Lampung, the main pepper growing season is from February until June. Because of the complexity of pest and disease attacks, it was hard to get a good idea of the yield-reduction caused by each pest or disease.

The conclusion might be that thrips form the major insect pest and the various viruses are the major disease limiting chilly pepper production.

It should nevertheless be taken into regard that the result of this survey only gives a momentary overview, which means that problems might be quite different in any other time of the year.

1 : Summary of inventory of pests and diseases on chilli pepper in
Bekasi and Lampung.

pn	Cultivar	Cultivation	Pesticides	Pests	Virus	Fungal + bacterial diseases
ngbungin	Paris Batu, Garis Minyak	Sawah	Decis, Thiodan, Dursban.	Thrips, mites, <u>Spodoptera</u> sp.	CMV, TEV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot.
h Abang	Super Pendek, Super Panjang.	Dry land	Furadan, Curater, Mipcin, Tokuthion.	<u>Spodoptera</u> sp. mites.	CMV, TEV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot.
ang	Rende.	Sawah	Furadan.	Mites, Thrips, <u>Spodoptera</u> sp., termites.	CMV, TEV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot,
arusah	Rende.	Sawah	Matador, Curacron.	Mites, Thrips	CMV, TEV.	Anthrachnose, Cercospora leaf spot.
g timur aton	Tampar, Tampar Skin- cau, Tampar Gisting.	Dry land	Diazinon, Agrothion, Kiltop, Delsene, Antracol, Dithane.	<u>Epilachna</u> .	CMV, TEV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot. Fusarium wilt.
karame	Tampar	Dry land	Fastac.	Aphids.	-	Anthrachnose, Cercospora leaf spot.
ng Selatan nj. Bintang	Tampar, Tam- par Skincau, Tampar Gisting.	Sawah	?	Thrips, Mites	CMV, TEV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot, Fusarium wilt.
ingsewu	Teropong.	Sawah	Dursban, Curacron, Tamaron.	Thrips, Mites, <u>Spodoptera</u> sp.	CMV, TRV, PVY.	Anthrachnose, Cercospora leaf spot, Fusarium wilt, Bacterial wilt.
dingrejo	Tampar, Tampar Skincau, Tampar Gisting.	Dry land	Baythroid, Pastac, Curacron.	-	TEV, TRV.	?
ung Tengah ekalongan	Tampar, Tampar Skin- cau, Tampar Gisting.	Dry land	?	Aphids, Thrips, Mites, <u>Epilachna</u> .	CMV, TEV, PVY.	?
unggur		Dry land	?	Mites, Aphids, Thrips.	-	Anthrachnose, Cercospora leaf spot, Fusarium wilt, Bacterial wilt.
ung Utara Abung Selatan	Tampar, Tampar Gis- ting, Tampar Skincau.	Dry land	?	Mites, Aphids, Beetle, Thrips.	CMV, TRV, TRSV, PVY.	Anthrachnose, Cercospora leaf spot, Fusarium wilt, Bacterial wilt.

RECOMMENDATIONS

The result of this survey stresses the need for further research on chilly peppers.

As well in the field of cultural practices as in the field of plant protection much progress can be achieved. Research will be carried out to tackle the most important problems first. These are the problems with virus and insect pests. Attention should also be paid to the genetic improvement of the cultivars.

The purpose of this research should be the publishing of a chilli pepper growing guide. In this way the extension service could be informed and therefore be able to give necessary information to the farmers. Transfer of information will then be a very important factor.

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Annex 1 : Production, export and import of chilli pepper in Indonesia 1980-1986.

Year	Production (ton)	Export (ton)				Import (ton)			
		Cabe ** segar	Cabe kering	Cabe giling	Cabe lain	Cabe segar	Cabe kering	Cabe giling	Cabe lain
1980	207,551	-	-	-	-	-	-	-	-
1981	219,445	5	18	10	46	3	593	2	4
1982	175,092	-	51	-	-	2	789	1	9
1983	295,760	172	134	-	-	4	551	5	15
1984	313,685	32	124	-	-	1	1278	<1	11
1985	511,043	11	134	-	-	<1	2174	<1	3
1986 *)	-	2	10	-	-	-	1552	<1	8

From : Dit. Bina Program Tanaman Pangan (1980-1985)
Dit. Jen. Pertanian Tanaman Pangan (1987).

*) tentative data until June 1986

**) Cabe segar = fresh pepper

Cabe kering = dry pepper

Cabe giling = ground pepper

Cabe lain = others

Annex 2 : Planted area, total yield and average yield
of hot pepper in Indonesia, 1985.

Island	Area (Ha)	Yield (Ton)	Average Yield (Ton/Ha)
1. Sumatra	44,570	86,360	1.9
2. Jawa	195,455	385,516	2.0
3. Bali & Nusa Teng- gara.	3,852	11,115	2.9
4. Kalimantan	3,799	5,849	1.5
5. Sulawesi	7,496	19,692	2.6
6. Maluku & Irian Jaya	962	2,511	2.6
INDONESIA	256,134	511,043	2.0

From : Dit. Bina Program Tanaman Pangan, 1985.

Annex 3 : Survey to Jakarta, Bekasi and Lampung : Time-schedule and activities.

Date	Activities
31-08-88	Morning : Travel: Lembang - Jakarta Afternoon : Visit Puslitbang Hortikultura and Dinas Pertanian DKI Jakarta.
01-09-88	Morning : Visit KaSuDin Wilayah Pertanian Jakarta Pusat. Till afternoon : Survey in kecamatan Kemayoran, Senen and Cibubur (Central and East Jakarta).
02-09-88	Morning : Visit Dinas Pertanian Bekasi Till afternoon : Survey in kecamatan Cabangbungin (North Bekasi).
03-09-88	Survey in kecamatan Lemah Abang, Serang and Cibarusah (South Bekasi).
04-09-88	Travel : Jakarta - Tanjungkarang.
05-09-88	Morning : Visit Dinas Pertanian Propinsi Lampung. Till afternoon : Survey in kecamatan Kedaton, and Sukarame (East Lampung).
06-09-88	Survey to kecamatan Tanjung Bintang, Gadingrejo and Pringsewu (South Lampung).
07-09-88	Survey to kecamatan Pekalongan and Punggur (Central Lampung).
08-09-88	Survey to kecamatan Abung Selatan (North Lampung).
09-09-88	Collection of secondary data.
10-09-88	Travel : Tanjungkarang - Lembang.



Annex 4. Varieties of chilli pepper, grown in the lowland area of Bekasi and Lampung, and their description.

A) Names of the varieties found in visited locations

Location	Name variety
Bekasi	
Cabangbungin	Paris Batu, Paris Minyak
Lemah Abang	Super pendek, Super panjang
Serang	Rende
Lampung	
Kodya Bandar Lampung	Tampar.
Lampung Tengah	Tampar Skincau
Lampung Selatan	Tampar Gisting
Lampung Utara	
Pringsewu	Teropong

B) Names of varieties collected in local markets or obtained from farmers :

Market	
	Rembang
	Keriting
	Minyak
	Tampar
	Cabe rawit
Farmers	
	Cilember
	Tampar Skincau
	Terong

C) Brief description of the different collected varieties

- Paris Batu	
. Plant growth habit	Compact
. Fruits :	
- Neck at base	: Absent
- End	: Pointed
- Surface	: Smooth
- Color young fruit	: Light green
- Color old fruit	: Red
- Position of fruit	: Declining
- Average length	: 14.2 cm
- Average diameter	: 1.1 cm

- Paris Minyak
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Absent
 - End : Pointed
 - Surface : Smooth
 - Color young fruit : Dark green
 - Color old fruit : Red
 - Position of fruit : Declining
 - Average length : 13.1 cm
 - Average diameter : 1.3 cm

- Rende
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Present
 - End : Pointed
 - Surface : Smooth
 - Color young fruit : Very light green
 - Color old fruit : Red
 - Position of fruit : Declining
 - Average length : 9.1 cm
 - Average diameter : 1.3 cm

- Super Panjang
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Present
 - End : Pointed
 - Surface : Smooth
 - Color young fruit : Dark green
 - Color old fruit : Red
 - Position of fruit : Declining
 - Average length : 11.4 cm
 - Average diameter : 1.4 cm

- Super Pendek
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Present
 - End : Blunt
 - Surface : Smooth
 - Color young fruit : Dark green
 - Color old fruit : Red
 - Position of fruit : Declining
 - Average length : 8.1 cm
 - Average diameter : 1.6 cm

- Tampar
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Absent
 - End : Pointed
 - Surface : Corrugated
 - Color young fruit : Green
 - Color old fruit : Red
 - Position of fruit : Declining
 - Average length : 12.4 cm
 - Average diameter : 0.8 cm

- Tampar Skincau
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Absent
 - End : Pointed
 - Surface : Corrugated
 - Color young fruit : Green
 - Color old fruit : Dark green
 - Position of fruit : Declining
 - Average length : 9.1 cm
 - Average diameter : 0.5 cm

- Tampar Gisting
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Absent
 - End : Pointed
 - Surface : Corrugated
 - Color young fruit : Dark green
 - Color old fruit : Red
 - Average length : 6.9 cm
 - Average diameter : 0.6 cm

- Teropong
 - . Plant growth habit : Compact
 - . Fruits :
 - Neck at base : Absent
 - End : Pointed
 - Surface : Slightly corrugated
 - Color young fruit : Dark green
 - Color old fruit : Red
 - Average length : 11.5 cm
 - Average diameter : 1.0 cm

Annex 5. Major insect pests on chilli peppers and other crops in the lowland area of Jakarta, Bekasi and Lampung.

Location	Crop	Insect pests	Severity*)

JAKARTA			
Kemayoran	Lettuce	<u>Plutella xylostella</u>	1
		<u>Phyllotreta vittata</u>	1
	Mustard	<u>Plutella xylostella</u>	1
		<u>Phyllotreta vittata</u>	3
		Thrips	1
	Caisim	<u>Plutella xylostella</u>	3
		Thrips	1
	Shallot	<u>Spodoptera exigua</u>	1
		Thrips	1
	Kangkung	<u>Oxva chinensis</u>	1
		<u>Phyllotreta vittata</u>	1
	Basil	-	-
Senen	Lettuce	<u>Plutella xylostella</u>	1
	Mustard	<u>Plutella xylostella</u>	1
		<u>Phyllotreta cruciferae</u>	3
		Thrips	1
	Chinese-broccoli	<u>Phyllotreta vittata</u>	2
	Bunching onion	Thrips	1
	Amaranth	<u>Phyllotreta vittata</u>	1
		<u>Epilachna</u> sp.	1
Kangkung	<u>Oxya chinensis</u>	1	
	<u>Phyllotreta vittata</u>	1	
BEKASI			
Cabang Bungin	Chilli pepper	Thrips	3
		Mites	3-4
		<u>Spodoptera</u> sp.	2
	Mungbean	<u>Spodoptera</u> sp.	4
<u>Epilacna</u> sp.		1-2	
Lemah Abang	Chilli pepper	<u>Spodoptera</u> sp.	3-4
		Mites	



Location	Crop	Insect pests	Severity*)
Serang	Chilli pepper	Mites	1
		Thrips	1
		<u>Spodoptera</u> sp.	2
Cibarusah	Chilli pepper	Mites	1
		Thrips	1
		<u>Spodoptera</u> sp.	2
		Termites.	1
LAMPUNG TIMUR			
Kedaton	Chilli pepper	Mites	2
			1
Sukarame	Chilli pepper Tomato Caisim Yardlong- bean	Aphids	1
		<u>Heliothis armigera</u>	3
		<u>Phyllotreta vittata</u>	2-3
		<u>Spodoptera</u> sp.	1
		Aphids	1-2
LAMPUNG SELATAN			
Pringsewu	Chilli pepper " "	<u>Orthoptera</u> sp.	2
		Thrips	4
		Mites	3
		<u>Spodoptera</u> sp.	1-2
Tanjung Bintang	Chilli pepper	Thrips	3
		Mites	2-3
Pekalongan	"-	Aphids	1
		Thrips	1
		Mites	4
		<u>Epilachna</u> sp.	1
LAMPUNG TENGAH			
Punggur	Chilli pepper	Mites	1
		Aphids	1
		Thrips	1
LAMPUNG UTARA			
Abung Selatan	Chilli pepper	Mites	3
		Aphids	1
		Beetles	1
		Thrips	1

*) Severity :

- 1 : 0-25 % attacked
2 : 25-50 %
3 : 50-75 %
4 : 75-100 %



Annex 6. Major diseases on chilli peppers in the lowland area of Bekasi and Lampung.

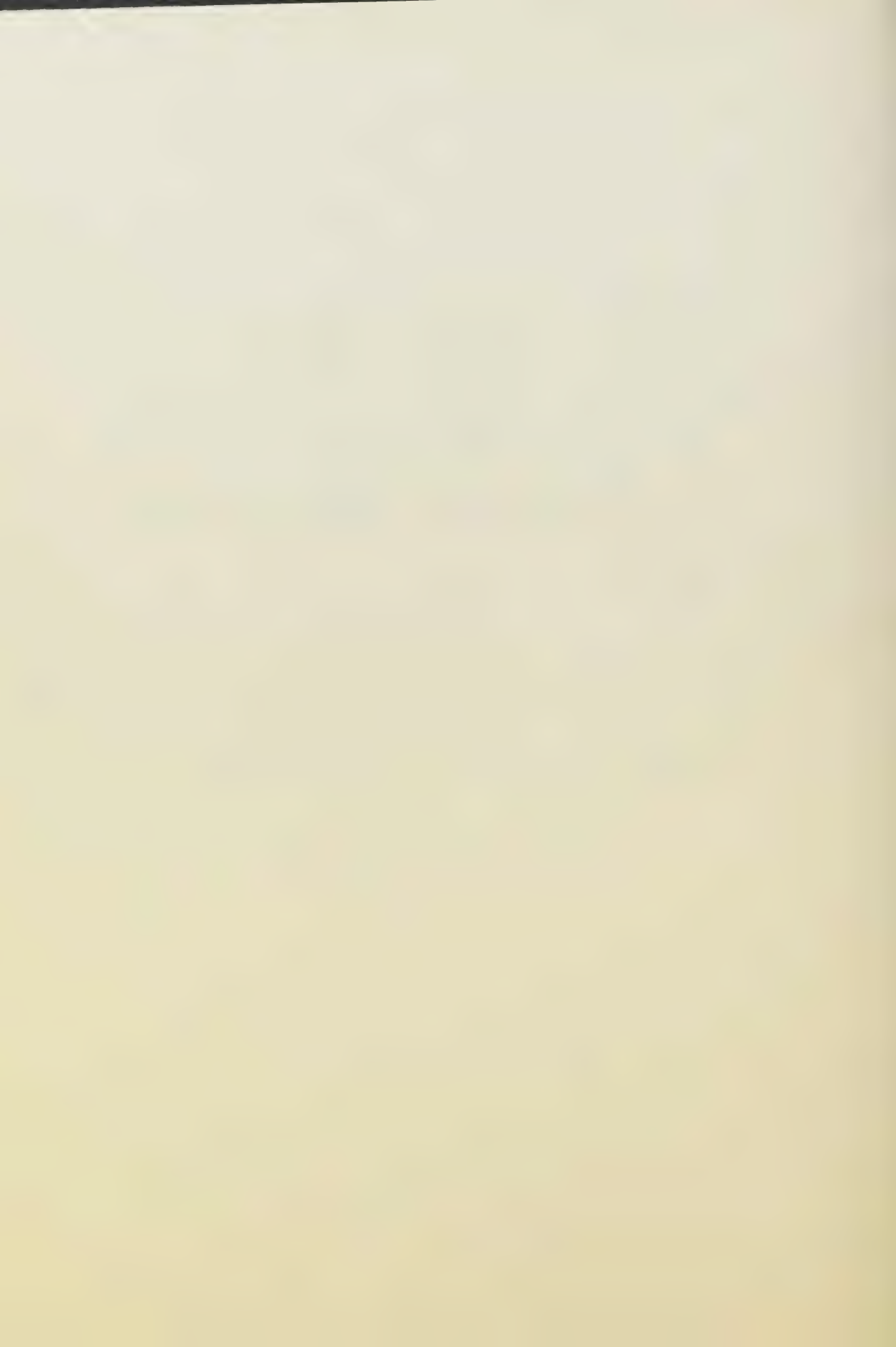
A) Fungal and bacterial diseases.

Location	Anthrachnose	Cercospora leaf spot	Fusarium wilt	Bacterial wilt

Bekasi				
Cabang Bungin	medium	medium	slight	-
Lemah Abang	slight	medium	-	-
Serang	slight	slight	-	-
Cibarusah	medium	slight	-	-
Lampung Timur				
Kedaton	medium	medium	slight	-
Sukarame	medium	slight	-	-
Lampung Selatan				
Tanjung Bintang	slight	medium	slight	-
Pringsewu	slight	medium	slight	slight
Lampung Tengah				
Pekalongan	-*	-*	-*	slight
Punggur	medium	medium	slight	slight
Lampung Utara				
Abung Selatan	medium	medium	slight	slight

-* = samples got lost

N.B. slight = 0 - 35 % of the plants attacked
medium = 35-65 % -"
severe = 65-100 % -"



B) Viral diseases, detected in leaf samples of chilli pepper by ELISA-testing.

Location	number	PVY	CMV	TRV	TEV	TRSV
Bekasi	(37)	(9)	(18)	(13)	(14)	(8)
Cabangbungin	6	3	2	5	5	3
Lemah Abang	8	2	3	4	1	2
Serang	19	4	10	4	7	3
Cibarusah	5	0	3	0	1	0
Lampung Timur	(20)	(7)	(6)	(11)	(4)	(2)
Kedaton	20	7	6	11	4	2
Sukarame	0	0	0	0	0	0
Lampung Selatan	(18)	(3)	(6)	(8)	(3)	(2)
Tanj. Bintang	10	2	4	5	2	2
Pringsewu	3	1	2	2	0	0
Gadingrejo	5	0	0	1	1	0
Lampung Tengah	(18)	(6)	(10)	(5)	(4)	(4)
Pekalongan	3	2	2	0	1	0
Punggur	15	4	8	5	3	4
Lampung Utara	(11)	(2)	(8)	(4)	(0)	(2)
Abung Sel.	11	2	8	4	0	2

N.B. : The reaction of the ELISA-test for PVX, and TSV was difficult to read. The test on TMV still has to be done with indicator plants.

